

#### ABSTRACT OF THE DISCLOSURE

A high-throughput assay for characterizing a subject's genetic makeup is disclosed. Specifically, a high-throughput assay utilizing PCR is disclosed that permits the rapid and accurate characterization of a subject's inherited alleles of the polymorphic glutathione S-transferase (GST) genes GSTM1, GSTM3, GSTP1, and GSTT1. This method allows detection of the specific alleles inherited, including the gene dosage of GSTM1 and GSTT1 while not requiring restriction endonuclease digestion of the PCR products in order to detect length differences. Further, the method allows all analyses to be performed simultaneously in the same gel lane, thus further adding efficiency and cost-effectiveness.